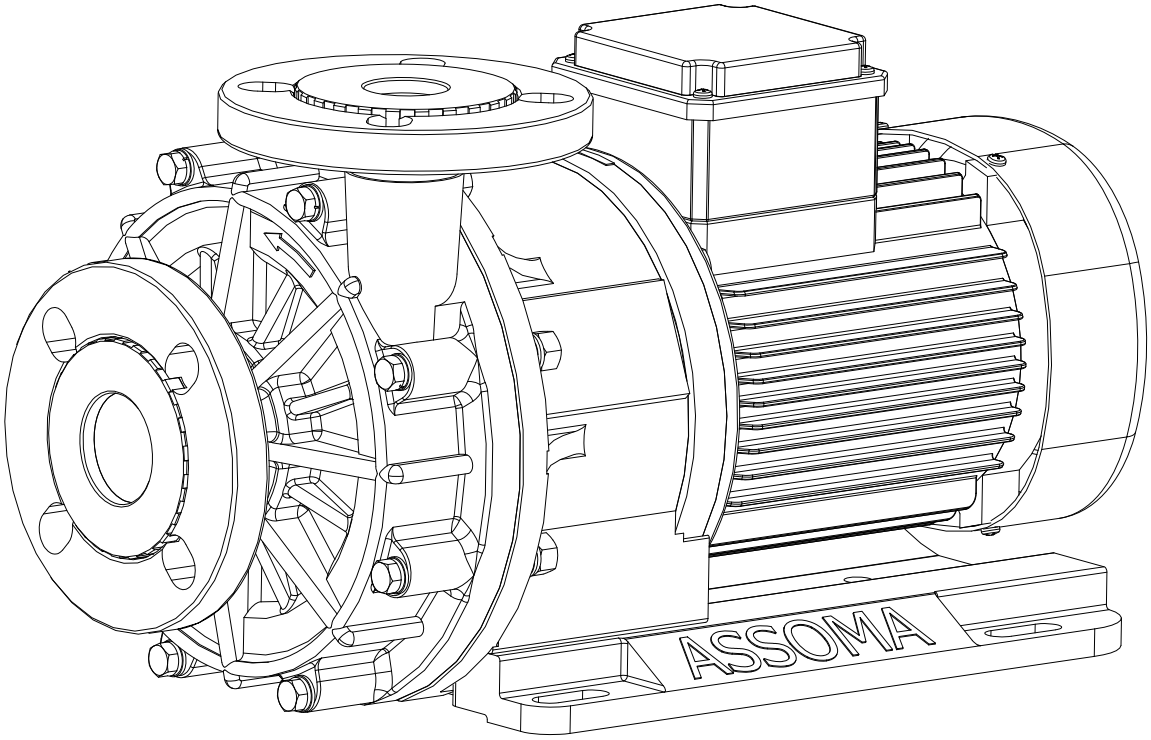
AMX SERIES

MAGNETIC DRIVE CHEMICAL PUMP

USER MANUAL



ASSOMA INC

Symbols used

	Situation where improper handling or operation failure to follow this manual would almost certainly result in death or serious bodily injury.

	Situation where improper handling or operation or failure to follow this manual could result in serious bodily injury or death.

	Situation where improper handling or operation or failure to follow this manual could result in bodily injury and/or equipment damage.

	When pump is installed in an environment with a potentially explosive atmosphere, strict adherence to our instructions must be followed (shown in this manual with the Ex symbol). Situation where improper handling or operation or failure to follow instructions in this manual would almost certainly result in serious bodily injury or death.

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1. Foreword

Thank you for purchasing an ASSOMA pump. To ensure proper operation and maximum efficiency, please read this instruction manual carefully. Failure to follow the recommended operating instructions outlined in this manual may result in serious personal injuries and/or equipment damage.

2. Safety Requirements

This section lists general information about safety. The relevant safety requirements of installation, wiring, operation and maintenance will set out in the relevant sections. ASSOMA INC. may not be held responsible for personal loss or property damage resulting from failure to follow the safety instructions contained herein.

 	1. A CE certified motor should be used. 2. The explosion-proof rating of the AMX-Series pump is dependent on the material selected and motor used. Please consult our order specification sheet or contact one of our local representatives to select the best product for your needs. Refer to Annex C. for a description of the ATEX markings. 3. Be sure to turn off the power before connecting, disconnecting or making any changes to the pump's wiring. 4. The customer shall not modify the pump under any circumstances. Doing so could result in an unexpected accident. ASSOMA INC. shall not be responsible for accidents or damage resulting from equipment modified by the customer. 5. Be sure to take special precautions when performing operations if using hazardous, explosive or inflammable liquids. 6. Strong magnetic field warning: The AMX pump uses strong permanent magnets which may affect certain medical devices (such as pacemakers). Personnel with such devices are advised to consult their physician and device manufacturer to determine a safe distance from the pump.
	1. The pump operator and pump operation supervisor must not allow any operator who has little or no knowledge of the pump to run the pump. Pump operators must have a sound knowledge of the pump and its operation. 2. Do not use a damaged pump. Doing so could result in injury or fire. 3. Keep the pump away from heat source or direct flame. Do not place any open flame or flammable object near the pump.
	1. Transport, installation, piping and wiring connections, operation, adjustment, maintenance and inspection should be carried out by qualified personnel. Having unqualified personnel perform these tasks could result in electric shock, injury or fire. 2. Do not block name plate or warning labels from view. 3. Do not stand on the pump or place heavy objects on the pump under any circumstances. Failure to comply may result in equipment damage and/or serious injury. 4. Disposal of used or damaged pump must be done in accordance with local laws and regulations.

3. Inspecting the Pump Prior to Unpack the Carton/ Install the Pump

(1) Check the pump exterior for any physical damage that may have been incurred during shipping.

(2) Use a small screwdriver to rotate the impeller of the motor's cooling fan. The fan should turn easily. If the fan feels tight or if there are unusual sounds, the interior of the pump may have been damaged during shipping.

(3) If there is any damage to the pump, please contact the seller immediately to arrange for replacement parts, and to allow for timely communication with the logistics company to determine liability.

(4) Each pump has a nameplate, indicating the pump model, MFG number, rated head, flow rate, and motor power, voltage and frequency. Check these data to ensure they comply with your order and application.

(5) Although some motors are marked usable for both 50 Hz and 60 Hz, the impeller size of the pump should be trimmed according to frequency applied. Application under incorrect frequency may cause motor overload (use under higher frequency) or pump under-performance (use under lower frequency).

(6) Nameplate information (including motor nameplate and pump nameplate) plays an important role for the operation and maintenance of the pump. It is proposed to re-copy data on nameplates and store it securely.

(7) The flow and head on the nameplate is the rated operating point or the operating point based on customer demand. Where "Head" means "Total head"

Total Head= Static Head + Dynamic Head

$$\text{Total head} = H_S + \frac{V_2^{\,2} - V_1^{\,2}}{2g}$$

	The pump is designed and manufactured to the specifications agreed upon by the user and ASSOMA INC. such as fluid composition, fluid temperature, working pressure, environmental conditions and necessary operational information. Use the pump strictly in accordance with the pump specifications and application range. If the user intends to change the operation condition, please contact ASSOMA INC. or the authorized dealer in the near region to obtain the permission in writing before operation.
	Unpack a pump for inspection without proper hoisting, support, or lifting equipment may cause serious personal injury or damage to the pump.

4. Installation, Piping and Wiring

4.1 Installation Location

(1) The pump should be close to the ground and located near the inlet tank.

(2) There should be sufficient space reserved around the pump to facilitate future maintenance and repairs.

(3) The pump and its wiring should be placed in a relatively dry environment, protected from possible flooding.

(4) Install in a location where the ambient temperature will not rise above 40 °C.

(5) Secure the pump to a level base plate or to an equipment with anchor bolts.

(6) May not be used at altitudes above 1000 m.

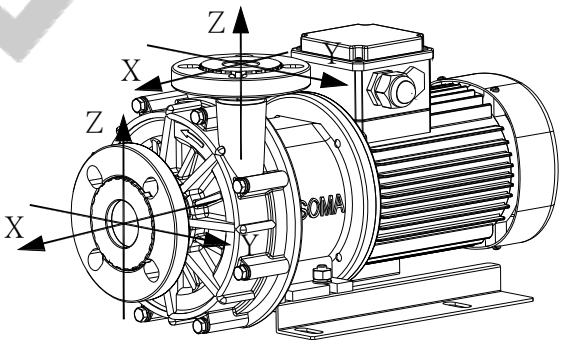
WARNING	1. Be sure to use the hanger bolt (where applicable) to lift the pump. Lifting from other parts of the pump may damage the pump. When hoisting, do not pass under a raised pump. A serious injury could occur if the pump is accidentally dropped. 2. Before lifting, check the weight of the pump. Do not lift a pump which exceeds the rated weight of the hoist. And, be sure no one is standing below the pump while lifting or transporting.
CAUTION	Special care should be taken when installing or storing the pump in the following places. Please consult with ASSOMA INC. or authorized dealer in the near region: 1. Places where flammable gas, dust or material is used or placed.Places where corrosive gas is generated. 2. Places where the ambient temperature is higher than 40 °C or lower than 0 °C.

4.2 Piping

(1) AMX flange is the RF type adjustable flange which can be oriented to match corresponding bolt holes to facilitate piping installation.

(2) AMX flange screw is either M16 or 5/8". The tightening torque is 5 N · m.

(3) The allowable load of pipe on the pump is as follows:



Model	SUCTION							
	Force (N)				Moment (N · m)			
	Fx	Fy	Fz	ΣF	Mx	My	Mz	ΣM
AMX-220/221	100	80	80	150	15	25	15	50
AMX-440/441	120	100	100	180	20	30	20	60
AMX-542/552 AMX-543/553 AMX-545/555	120	100	100	180	30	50	30	75
AMX-653/655	150	120	120	200	30	50	30	75

Model	DISCHARGE							
	Force (N)				Moment (N · m)			
	Fx	Fy	Fz	ΣF	Mx	My	Mz	ΣM
AMX-220/221	80	100	80	150	15	25	15	50
AMX-440/441 AMX-542/543 AMX-545	100	120	100	180	20	30	20	60
AMX-552/553 AMX-555	120	150	120	200	30	50	30	75
AMX-653/655	120	150	120	200	30	50	30	75

※ The values in table are applicable for within 40 °C

4.3 Notes for Installing the Piping System

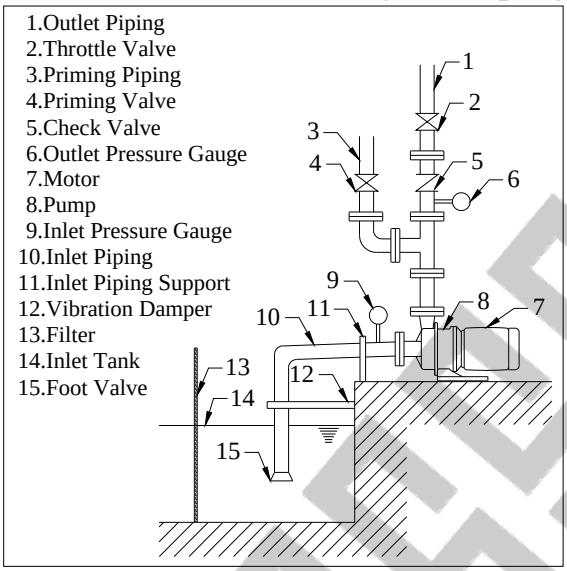


Fig. 4.1

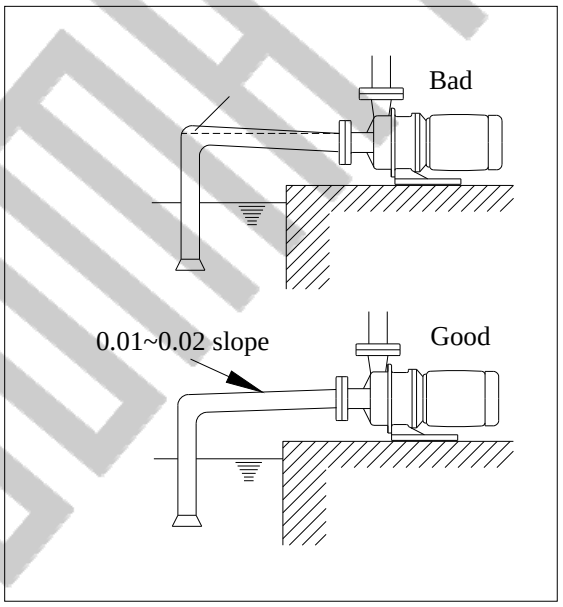


Fig. 4.2

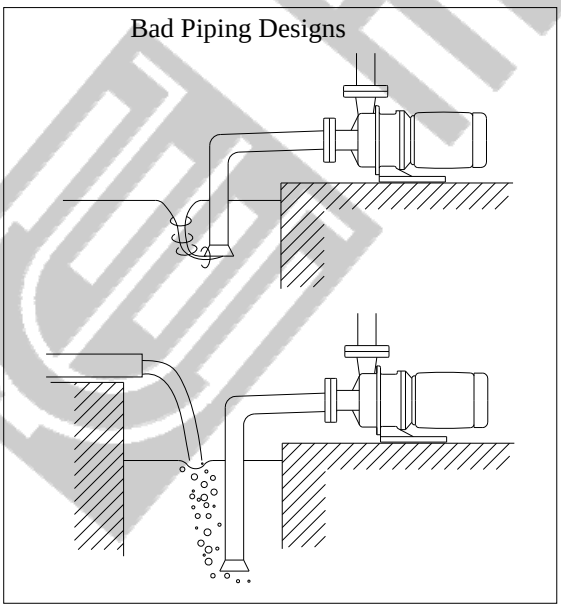


Fig. 4.3

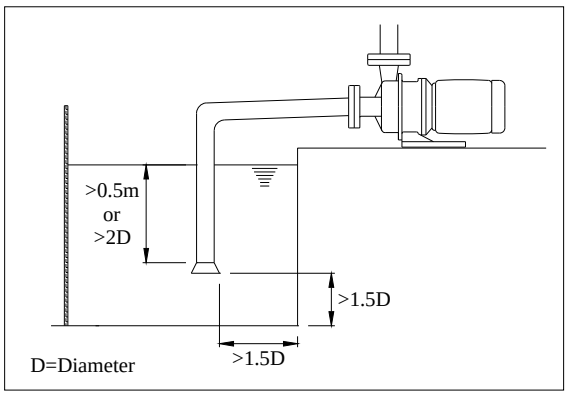


Fig. 4.4

Procedure		Items to Note
Inlet Piping	General requirements	1. Suction condition must satisfy NPSHa>NPSHr+0.5 m 2. Reduce inlet Head as much as possible. Use straight and short piping. 3. The pipes should have adequate structural support and shouldn't use the pump as its primary support. (see Fig. 4.1) 4. When designing supports, consider the effects of temperature changes on the supports to avoid thermal stress. 5. Inlet piping and connectors should be installed properly to prevent drawing in air. 6. The piping system should not have upward bumps that may collect air. The inlet piping should also have a 0.01~0.02 slope increase towards the pump. (see Fig. 4.2) 7. There should not be any elbows for at least 5 times the pipe diameter from the opening of the pump. The elbow closest to the pump opening should be a long radial elbow.
	Inlet piping	1. There should be at least a 1.5 diameter distance between the pipe inlet and the closest tank wall to prevent circulation. (see Fig. 4.4) 2. The submerge depth of the inlet should be at least 0.5 m or at least twice the pipe diameter below the liquid surface. (see Fig. 4.4) 3. There should be a distance of at least 1.5D between the bottom of the tank and the beginning of the inlet pipe opening. (see Fig. 4.4) 4. If there are two or more inlet piping in the same tank, they should be placed at least 3D apart to prevent mutually disrupting each other's flow.
	Foot valve	Please install a foot valve if upward suction is used. (see Fig. 4.1)
	Self-priming cylinder	1. If suction method is upward suction, please install a self-priming cylinder to prevent dry-running due to a leaking foot-valve. 2. The size of the self-priming cylinder should have a minimum liquid level of at least 0.5 m above the opening of the pump.
	Control valve	1. A control valve should be installed to make disassembling of the pump easier. The valve should only be shut off when the pump is to be detached for maintenance or repairs. 2. We recommend the use of valves that have the least loss when fully opened, like a gate valve.
	Filter	1. It is generally not recommended to install a filter in front of a pump, which can unpredictably increase suction system resistance. 2. If a filter has to be used, it should be cleaned regularly to ensure a smooth flow.
	Vacuum gauge	1. The material used should be corrosion resistant, otherwise, a pressure gauge diaphragm should be used. 2. During operation, if the vacuum gauge reading fluctuates, either there are air bubbles in the system or cavitation has occurred.
Outlet Piping	General requirements	1. The weight of the outlet piping should be properly supported to prevent putting excessive stress on the pump. (see Fig. 4.1) 2. A priming piping must be installed if the suction system does not employ positive pressure, i.e. upward suction. (see Fig. 4.1) 3. The flow rate in the outlet piping should not exceed 3 m/sec. 4. The ability for each component in the piping system to withstand pressure should be calculated, to determine the maximum allowable operating pressure.

Procedure		Items to Note
	Priming piping	Upward suction pumps that do not have a self-priming cylinder should have a priming piping system.
	Pressure gauge	1. Pressure gauge used should be able to read beyond the maximum operating pressure. 2. Pressure gauge should be made of material that is corrosive resistant, otherwise a diaphragm should be used. 3. A valve can be installed on the piping that leads to the pressure gauge, to facilitate maintenance and to lengthen the gauge's service life. 4. During operation, if the pressure gauge reading fluctuates, either there are air bubbles in the system or cavitation has occurred.
	Check valve	A check valve should be installed in the following situations: 1. Outlet piping is long. 2. Head of outlet is more than 15 m. 3. Discharge pressure exceeds 2 kg/cm^2 and flow rate exceeds 3 m/sec 4. Two or more pumps share the same outlet piping system. 5. To prevent back flow (water hammer) from damaging the pump during unexpected power outages.
	Control valve	1. A control valve can be used for controlling the flow of fluids. Do not run the pump with the control valve closed for an extended period of time. 2. When starting the pump, always start with a closed valve, and then slowly open the valve to obtain the desired operating pressure and flow. Always open or close the valve gradually. **3.** To facilitate the adjustment of discharge flow and the adjustment of motor overload, it is recommended to install valves on outlet piping. And if both a check valve and a control valve are to be installed, the order of allocation is pump → check valve → control valve.
	Exhaust valve	A vent should be installed if the horizontal section of the outlet piping is very long.

	Be cautions when dangerous liquids are transferred: When the pumps are used to transfer dangerous liquids listed as below, the pump, piping and fittings must be checked and monitored to ensure no leakage occurs. Leakage may result in personal injury, explosion, and/or fire. 1. Explosive and inflammable liquids. 2. Corrosive liquids. 3. Toxic liquids. 4. Liquids harmful to the human body or detrimental to health. 5. Liquids that could produce a chemical reaction.

4.4 Wiring

The wiring system should be done properly by qualified personnel, using premium equipment and complying with established rules and standards. The following recommendations should also be implemented:

(1) Power frequency, voltage and capacity should strictly follow the motor's specification sheet and name plate.

(2) Please select the proper non-fuse switch (NFB) according to the rated current of the motor.

(3) When using the pump for outdoor applications, please make sure the switch is protected from rain.

(4) Keep the electromagnetic contactor (MC) from a pump at a suitable distance, with a clearly marked warning sign to avoid false starts.

(5) Tags at the end of wires (or Diagram shown in the terminal box) and method of connection are based on the number wires (phases), power voltage and mode of start for the motor. Be sure to connect the power cable in accordance with name plate for the motor and the connection diagram in the terminal box

(6) All wiring operations must be in strict compliance with National Electrical Code and local regulations. Make sure to choose the correct wire size and fasten the locking screws to the right torque to prevent loose connections.

Table 4.1 Wire size

		Min. wire size (Recommended)
3 Hp & below	200~480 V	1.6 mm^2
5 Hp	200~230 V	2.0 mm^2
	380~480 V	1.6 mm^2

Table 4.2 Terminal screw and tightening torque

Screw size	**Tightening torque (Recommended)**
M4	15 kgf · cm
M5	25 kgf · cm
M6	45 kgf · cm
M8	80 kgf · cm
M10	120 kgf · cm

Table 4.3 Recommendations for Grounding Wire

Cross-sectional area of copper phase conductors supplying the equipment S mm^2	**Minimum cross-sectional area of the external protective copper conductors S_P mm^2**
$S \leqq 16$	S_P
$16 < S \leqq 35$	16
$S > 35$	$S_P / 2$

1. Be sure not to perform any type of maintenance while the power is on. It may lead to electric shock.
2. Power supply and wire connecting work should be performed by qualified personnel only.
3. After wiring, be sure to replace the terminal box cover in its original position. Failure to do so could result in electrical shock.

WARNING	1. Install an earth leakage breaker: The operation of a pump without using an earth leakage breaker may cause an electrical shock. Install an optional leakage breaker in the system before running operation. 2. The pump should be properly grounded with a recommended ground resistance of 10 Ω or less. (In Taiwan, use third type grounding) 3. Each pump must have a separate grounding wire directly connected to the common ground terminal, and must not form a loop between wires. 4. If long wiring results in more than 3 % voltage drop in the line, replace with bigger gage wires.

5. Notes for Operation

5.1 Dry-Running

(1) Our pump use the transfer fluid as its internal cooling system, therefore, dry-running the pump can cause the temperature to rise to a dangerous level that may seriously damage the pump.

(2) If dry-running occurs, switch off the pump immediately. Let it cool for at least an hour before priming the pump to prepare it for normal operation. NOTE: Do not subject the pump to rapid cooling, which may damage the internal parts.

(3) We recommend using a dry-run protector to detect dry-run occurrences to avoid causing unnecessary damage to the pump.

5.2 Operating Temperature

(1) Operating temperature may change the fluid's viscosity, vapor pressure, and corrosiveness. Please ensure that your pump is operating within the proper temperature range.

(2) The optimal temperature range for pumping pure water:
Casing material PPG：0～80 ^{o}C
Casing material ETFE+CF：0～95 ^{o}C

(3) Please consult your local distributor for the temperature range suitable for your chemicals.

(4) We recommend an operating environmental temperature to be between 0 ^{o}C～40 ^{o}C.

CAUTION	When the pump is used with a hot liquid, do not touch the front cover or the piping with your bare hands. It may cause burns. Any exposed hot surfaces, including pumps, motors and piping, must have warning signs prominently displayed. The parts should be isolated from accidental contact.

5.3 Concentrations, Viscosity and Specific Gravity

(1) A change in a fluid's concentration will usually affect its viscosity and specific gravity. Other physical properties like corrosiveness, may also change with the fluid's concentration, therefore, the selected pump material should be able to withstand the corrosive properties of the fluid.

(2) When the fluid's viscosity and/or specific gravity differ from that of water, the shaft power, flow rate and pump head may change as well.

5.4 Particle Size (Sludge)

(1) The service life of a pump may be greatly shortened by pumping fluids that carry small particles or sludge. Its service life is dependent on the concentration of the particles, its size, and hardness.

(2) For particle concentration less than 5 %, particle size smaller than 50 μm, and hardness within 80 Hs, SSiC bearings may be used. However, a shorter-than-normal service life can be expected.

CAUTION	Should foreign matter enter the pump, it may cause pump damage or failure. Turn off the power at once and remove the obstruction.

5.5 Maximum Operating Pressure

The pump's maximum operating pressure is dependent on the operating temperature and the structure of the pump. Please refer to Figure 5.1 for the recommended maximum operating pressure for our AMX SERIES pumps.

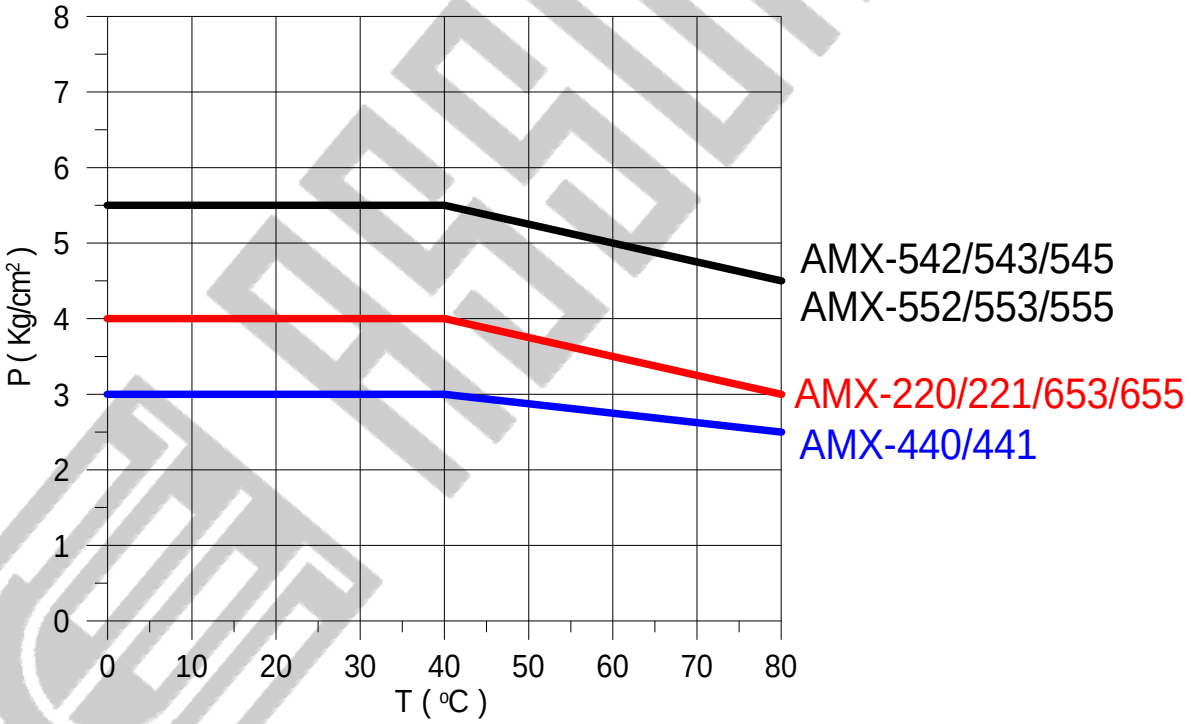


Figure 5.1

5.6 Minimum Flow

Our pump uses the pumped fluid as its cooling and lubricating system. A low flow rate may result in increasingly high temperature within the pump, and increased radial and axial force, thus, affecting the pump's performance and service life. Please use Table 5.1 for the recommended minimum flow rate:

Table 5.1 Unit: l/min

Temperature / Model	20 °C	40 °C	60 °C	80 °C
AMX-220/221	10	10	15	20
AMX-440/441	15	15	20	30
AMX-552/553/542/543	20	20	30	40
AMX-555/545	30	30	40	50
AMX-653/655	50	50	70	100

Note: Above data is based on water. For volatile or viscous fluids, please consult your local distributor.

Do not operate the pump with outlet valve shut off more than 1 minute. Long shut off time will cause the inside to heat up and may damage the pump.

6. Operating Procedure and Notes

6.1 Notes Prior to Starting the Pump

(1) Check the motor's power rating, including frequency, voltage and wiring.
(2) Recheck to make sure all the parts (flange, pump casing, base plate, etc.) are securely fastened.
(3) Fill the pump with liquid (priming) to remove any air within the pump and suction piping.
(4) Check to ensure the inlet valve is open.
(5) Using a screwdriver, rotate the motor's cooling fan to ensure it is not too tight or stuck.

6.2 Starting Up the Pump

(1) Check the direction of rotation of the motor by rapidly switching on and off the power.
(2) Direction of motor rotation can be checked from the fan side. It should be clockwise seeing from the fan cover (follow arrow direction on the fan cover). If the rotating direction reverses, change wiring phases by switching any two wire connections.
(3) Close the outlet valve and start up the pump.
(4) Slowly open the outlet valve when the motor has reached a stable speed. Adjust the outlet valve to obtain the desired operating pressure or flow rate.

6.3 Operating the Pump

(1) Shut down the pump immediately in the case of cavitation or dry-running.
(2) If decoupling should happen, shut down the pump to prevent reducing the magnet's strength.
(3) During power outages, shut off the pump's power supply and close the outlet valve.
(4) When switching on the pump with the outlet valve closed, the outlet pressure should increase. If the pressure fails to rise, or if the pressure is too low, shut down the pump and check the piping and wiring.

NOTE: Outlet Pressure = Inlet Pressure + Pump Pressure
Pump Pressure (kg/cm^2) = Fluid Specific Gravity * Pump Head / 10

6.4 Shutting Down the Pump

(1) Close the outlet valve slowly to prevent damage to the pump due to reverse fluid flow (water hammer).

(2) Shut off the pump. It should stop gradually. If not, check the interior of the pump for problems.

(3) The pump should be checked periodically. If the pump is used in a cold operating environment (relative to the fluid's freezing point), the fluid may crystallize even if the pump is shut down for a very short amount of time. To prevent crystallization, a drain plug should be included in the piping system or a heating system could be used to maintain the temperature during shutdown.

7. Maintenance and Inspection

7.1 Daily Inspection (See Table 7.1)

Table 7.1

Appearance	1. Check for oxidation or corrosion of the front casing, bracket, and base plate. 2. Check for leakage of the pump and the piping system. 3. Check the pump exterior for any physical damage such as corrosion, peeled paint.
Operation	1. Check for irregular sounds and vibrations. 2. Check for any abnormal overheating on the surface of motor, three-phase current imbalance, bearing noise, and foreign objects blocking the vent of fan, etc.. 3. Check the in-tank fluid levels and inlet/outlet pressures. 4. Check the current and motor loading. 5. Check and test-run backup pumps regularly to ensure they can function properly when needed.

7.2 Periodic Maintenance

(1) The following items should be inspected quarterly (refer to Table 7.2).

(2) Refer to Annex A for the pump's disassembly, assembly and special notes.

Table 7.2

Part Name	Inspection Item	Solution
Front and Rear Casing	1. Cracks 2. Scratch marks (except when pumping particle laden fluids) 3. Crystallization or sludge 4. Shaft support loose or deformed	1. Replace 2. Contact the distributor 3. Clean 4. Contact distributor
Gasket/O-ring	Deformed, corroded or swollen	Contact distributor
Impeller and Magnet	1. Scratch marks or cracks 2. Cracked bearing or crystallization	1. Contact distributor 2. Contact distributor

Assembly	3. Bearing displays signs of wear and tear 4. Crystallization and other sludge 5. Foreign objects stuck in impeller 6. Impeller deformed	3. Replace if worn excessively 4. Clean 5. Remove the objects 6. Contact distributor
Shaft and Thrust Ring	1. Scratch marks 2. Cracks	1. Contact distributor 2. Replace
Motor	1. Resistance of three phases and insulation impedance 2. Check amount of lubricant when using open bearing.	1. Repair or change if abnormal is found. 2. Keep amount of lubricant at proper level.

CAUTION	Used gasket or O-ring, even without displaying signs of corrosion, may also cause seal failure due to deformation or elastic reduction. We strongly recommend replacing the seals when the pump is under repair or service.

7.3 Maintenance and wear/tear limits

Table 7.3 Unit: mm

Model	Dimension / Part	New part	Time to change
AMX-220/221/440/441	Shaft outer diameter	15	14.5
	Bearing inner diameter	15	15.5
	Thrust ring thickness	6	5
	Wear ring thickness	6	5
AMX-542/543/545/552 AMX-553/555/653/655	Shaft outer diameter	18	17.5
	Bearing inner diameter	18	18.5
	Thrust ring thickness	7	6
	Wear ring thickness	7	6

Note: Table 7.3 provides the recommended dimensions for the bearing and shaft. However, the total wear between the shaft and bearing (bearing ID – shaft OD) must not exceed 0.5 mm. Similarly, the total wear between the thrust ring and wear ring must not exceed 1 mm. When replacing the individual parts, you may choose to replace just the parts that have more wear.

7.4 Preventive Maintenance

Operational data, like vibration, flow rate, voltage, etc. can be collected, and upper and lower limits can be set for each of the values. The collected data can be used for trend analysis (see Fig. 7.1), which can be a basis in which to determine when to carry out preventive maintenance.

AMX is made at factory with vibration below 3.0 mm / sec (r.m.s) (measured at flange edge of bracket), and the noise value is below 80 dB (at rated point).

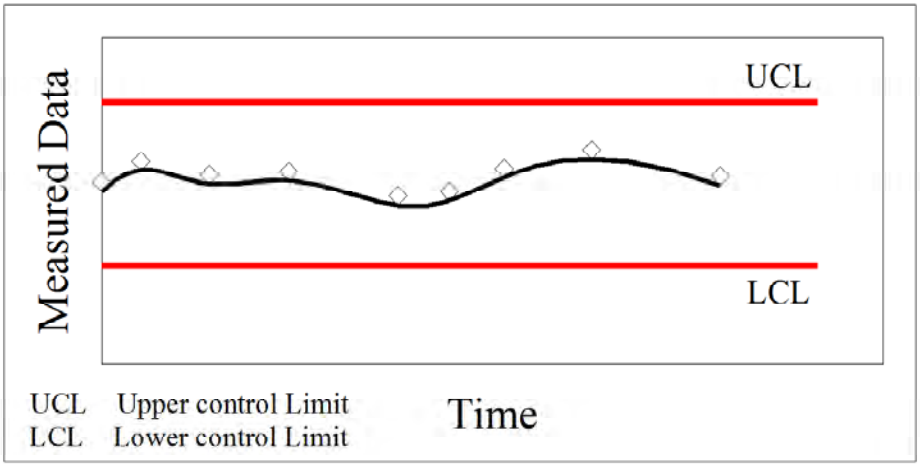


Fig. 7.1

DANGER	1. Strong Magnetic Field Warning: AMX's powerful permanent magnetic coupling could adversely affect persons who are assisted by medical electronic devices such as a pacemaker. 2. Be sure to turn the power off before performing any type of maintenance, repair or inspection. Make special provisions so that no other operator mistakenly turns on the power supply while someone is working on the pump. In a noisy or poor visibility environment, display a sign near the power supply switch to notify others that someone is "WORKING" on the pump. Power supply mistakenly turned on during maintenance may lead to personal injury.
WARNING	1. When handling chemicals, ventilate the work area well. In addition, the operator must wear protector gear (such as a safety mask, safety goggles, and protective gloves). 2. No remodeling: Remodeling of the pump by the user may result in serious injury, electric shock, or damage to the pump. Do not attempt to remodel as it is very dangerous. 3. Strong Magnet Warning: The impeller assembly contains strong magnets. Be careful not to get your hands or fingers pinched during assembly of the pump. Keep magnetic cards and electronic devices away from the pump to prevent the magnetic field from causing damage.
CAUTION	1. Use the right tools for any maintenance, disassembly, or assembly. 2. Be careful with hazardous liquids: If pumping dangerous chemicals, be sure to drain the pump before disassembling and rinse the parts and connecting pipes/fittings well after disassembly. Please note that small amounts of chemical may still remain in the internal parts or pipe fittings.

8. Incorrect Usage and Selection

	Abnormal Condition	Possible Symptom and Effect/Damage
Calculations or Incorrect	System resistance too high or Pump head too low	1. Insufficient or no flow. 2. Pump unable to effectively dissipate heat. 3. Excessive wear on bearing and thrust rings.
	Resistance lower than expected or Pump head too high	1. Excessive flow. 2. Overloading of the motor. 3. NPSHa too low, resulting in cavitation.

Abnormal Condition		Possible Symptom and Effect/Damage
	NPSHa too low, resulting in cavitation	1. High frequency vibration and noise. 2. Fracturing of the bearing and thrust rings. 3. Decreased pump performance and low flow rate. 4. Serious cases may result in dry-running.
	Specific Gravity higher than anticipated	1. Motor overloading. 2. Decoupling of the magnetic drive.
	Viscosity higher than anticipated	1. Motor overloading. 2. Decoupling of the magnetic drive. 3. Decreased pump performance and reduced flow.
	Wrong pump material selected	1. Corrosion and cracking. 2. Rapid corrosion and wearing of bearing. 3. Corrosion of the O-ring/gasket resulting in leakage.
Improper Piping or Layout	Inlet pipe not submerged sufficiently into the fluid or air sucked into piping system	1. Produce high frequency vibrations and noise. 2. Fracturing of the bearing and thrust rings. 3. Reduced pump performance. 4. Serious cases can lead to dry-running.
	Air pockets in inlet piping	1. Reduced pump performance. 2. Serious cases can lead to dry-running.
	Parallel pumps improperly installed	Improper suction, resulting in low efficiency, insufficient flow, cavitation or dry-running.
	Leaking foot valve or inlet piping	Fluids within pump leaks during shut-down period, resulting in dry-running when pump is restarted.
Improper Operation	Starting the pump without priming	Dry-running, causing damage to pump.
	Low speed or wrong rotation direction	Low fluid flow.
	Incorrect motor frequency or voltage	Overloading of the motor.
	Low inlet tank fluid level	1. Low performance and vibrations due to drawingin air. 2. Fracturing of the bearing and thrust rings. 3. Dry-running.
	Foreign objects stuck in impeller	1. Produce vibrations and noise. 2. Reduced efficiency and flow. Serious cases may result in dry-running.
	Low flow over extended period of time	1. Insufficient cooling of pump. 2. Excessive radial and axial force, reducing service life of bearing and thrust rings.
	Inlet valve closed	Dry-running, seriously damaging the pump.
	Transfer fluid temperature too high	1. Low NPSHa, resulting in cavitation. 2. Reduced strength of the magnet, resulting in decoupling.
	Fluid carries hard particles	1. Rapid wearing of the bearing. 2. Wearing of the impeller and casing surfaces.
Improper Maintenance	Deformation of the Gasket/O-ring	Result in leakage.
	Damaged impeller	1. Resulting in vibrations and noise. 2. Reduced pump performance and fluid flow.
	Damaged motor bearings	1. Produce vibrations and noise. 2. Overloads the motor. 3. High Motor temperature.

Abnormal Condition		Possible Symptom and Effect/Damage
	Wear ring worn off	1. Produce vibrations and noise. 2. Overloads the motor.
	Wearing of the impeller bearings	1. Produce vibrations and noise. 2. May result in fracturing of the impeller shaft.
	Pump's base screws loose	Produce vibrations and noise.
	Blockage of inlet piping or foot valve	1. Reduced pump performance and low flow rate or may result in cavitation. 2. Serious cases may result in dry-running.
	Blockage of the outlet piping	1. Low flow or no flow. 2. Pump unable to dissipate heat. 3. Serious cases may result in overheating of the pump and outlet piping

9. Repair and Warranty

When a problem arises, please read this instruction manual and try to troubleshoot the problem. If the problem cannot be found, or if replacement parts are needed, please call the distributor, and give them the following information:

(1) The pump model and manufacturing serial number indicated on the nameplate.

(2) The operating condition.

(3) The situation under which the pump fails.

Please refer to the warranty card for details of the warranty terms and conditions.

Annex A: Disassembling & Assembling the AMX Pump

A. Preparing for Disassembly

(1) For personal safety, wear protective gear, like corrosive resistant aprons and protective eyeglasses during disassembly, to prevent injuries caused by spilled chemicals.

(2) The magnets used in our AMX magnetic drive seal-less pumps have very strong magnetic strength. Take **extra** precautions when disassembling the pump to prevent personal injury and damage to electronic and magnetic equipments (like magnetic stripe cards, portable storage devices, cell phones, etc.).

(3) Make marks on corresponding terminals and contact points when disconnecting and removing motor wirings. It would prevent wrong connections when reassembling.

B. Notes for assembly

(1) Please follow the reverse procedure for disassembly to assemble the pump.

(2) When pressing the shaft bearing into the impeller, make sure the cut edge of the bearing matches the flat edge inside the impeller.

(3) Before assembly, use an adhesive tape to remove all metal fragments or debris that may be on the outside of the magnet capsule.

(4) When fastening the different parts of the pump, make sure to fasten the corresponding opposite screws in turn to ensure a uniform tightness.

(5) After the entire pump is assembled, use a small screwdriver to rotate the motor cooling fan to ensure everything is installed correctly.

(6) The tightening torque for the front casing of AMX Series：

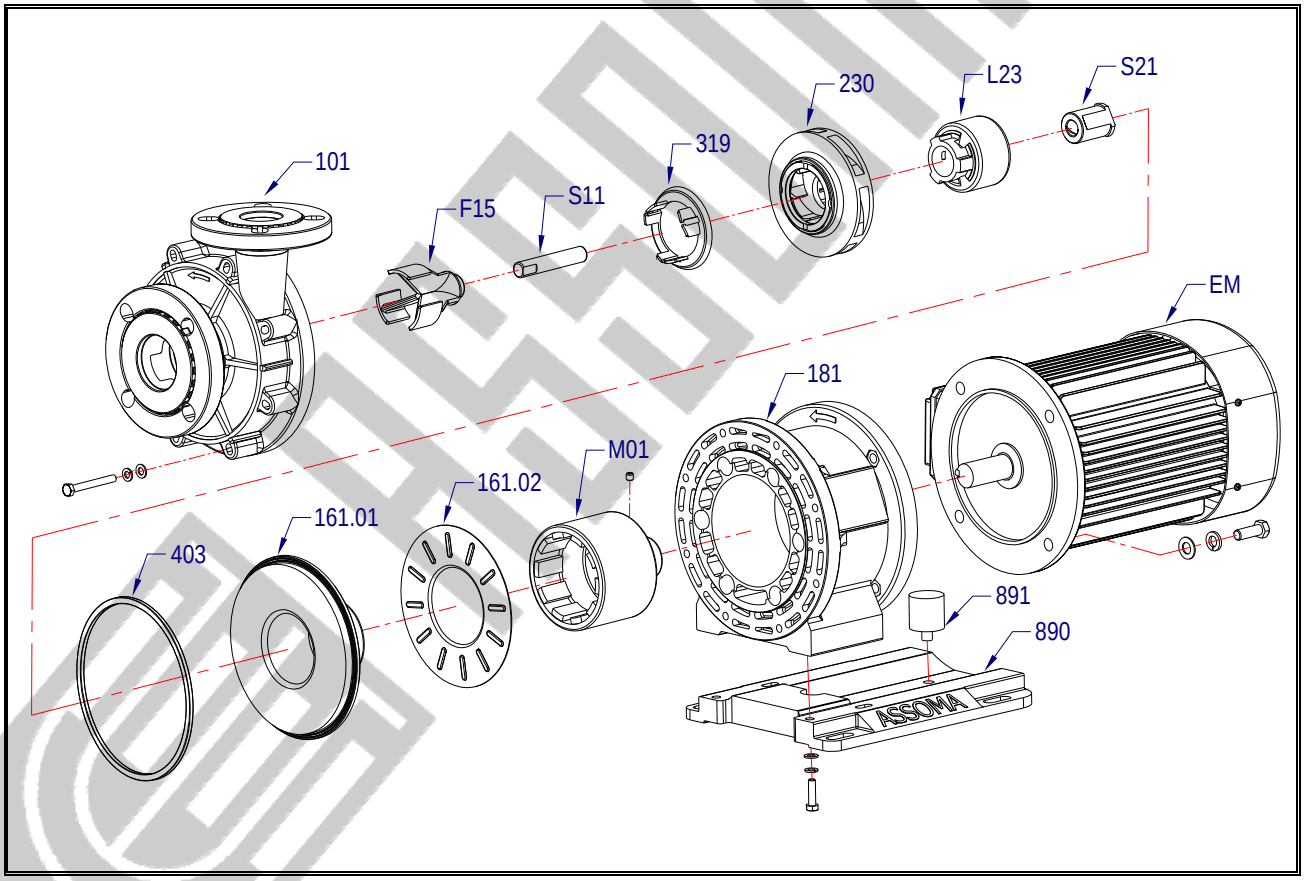
Casing material PPG：120±5 kgf・cm（12±0.5 N・m）.

Casing material ETFE+CF：100±5 kgf・cm（10±0.5 N・m）.

Annex B: Exploded View and Parts List

No.	Part Name	No.	Part Name
101	Pump casing flange assembly	403/RG+NO.	Gasket/O-ring
F15	Front support, shaft	161.01	Rear casing
S11	Shaft		Rear thrust ring
319	Front buffer	161.02	Backup plate
	Front thrust ring	M01	Drive magnet
230	Front wear ring	890	Base
	Impeller	891	Motor support (5 Hp pumps only)
L23	Magnet capsule	181	Bracket
S21	Bearing	EM	Motor

Note: The motor flange thickness may vary between different motor brands / models when replacing with a different motor. Please select the proper bolt specification (length) or contact your nearest distributor or agent recommendations.



Annex C. Description of ATEX-specific marking

1. The ATEX-specific marking of pump body (without motor) is indicated on the name plate.
2. Please check the name plate on the motor for ATEX-specific marking for the motor.

The ATEX-specific marking indicated on the name plate of AMX.

II 2 G c IIA T4

	Distinctive Community mark
II	Equipment group
2	Equipment category
G	Where explosive atmospheres caused by gases, vapors, or mists are concerned.
c	Protection type：Constructional safety
IIA	Gas subdivision
T4	Temperature class：Max. permissible surface temperature 135 °C

DANGER	1. When pump is installed in a potentially explosive atmosphere, be sure to select an explosion-proof motor, and make sure both the pump and the motor are suitably rated for the environment. 2. Both pump and motor must be properly grounded, or there may be a risk of static electric discharge. 3. Never run pump without priming. Never operate the pump below the minimum recommended flow rate for over 1 minute.